

# MnDOT Research Need Statement 730

## 1. Need Statement Champion(s) Information

### A. Research Champion

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### B. Research Co-Champion

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### C. Research Need Title (115 Characters):

Use of Colors in Dynamic Message signs for both Travel times and static sign simulation

### D. Potential Project Sponsor based on research need:

MnDOT Research Program

## 2. Research Need Background and Objective

### A. Background

- i. Describe the problem/opportunity:

MnDOT continues to look for improved methods to provide motorist information that is clear concise and easy to digest. The majority of MnDOT's roadway Dynamic Message Signs (DMS) are capable of full color/full matrix messaging. Finding new ways to display messages that are easier for roadway users to understand will help reduce distractions and increase safety.

All current guidance and regulations reference retroreflective colors for on static signs which look different to the human eyes than light emitted colors. With MnDOT's seat on the NCUTCD committee discussing these standards for the MUTCD, this research could provide clear evidential guidance for future standards. Documenting the differences between retroreflected colors and emitted colors will also help MnDOT provide input to rulemaking that will benefit MnDOT, local agencies, and national agencies as well.

- ii. If applicable, describe how project will build on previous research:

DMS Color Diagram - <https://mndot-lrrb.ideascale.com/c/static/media/attachment-preview.9726ec93.png>

- iii. If applicable, include title(s) or short description of previous research:

iv. What is the **objective** of the proposed research?

This proposed research would have two main objectives:

- 1) Multiple and competing factors affect how MnDOT produces the emitted colors from roadway Dynamic Messaging Signs (DMS). These factors include meeting NEMA TS4 and MUTCD color specifications, producing emitted colors that “match” the retro-reflected colors of static signs, and staying within the capabilities of current LED technology. The link in section ii above shows a graphical representation of these multiple competing affecting DMSs. Having a guide to vet out conflicts and a tool/program (possibly excel) to standardize the process of LED color selection is needed. For example, using the Red, Green, Blue (RGB) color model – the current input for “Purple” used by MnDOT is (110, 38, 123). Is that the optimal color to display “Purple” for the public? MnDOT has found in the past that emitted colors from DMSs need adjustments to match the retroreflective static sign colors.
- 2) MnDOT would also like to research and document the public’s perception between emitted colors on Dynamic Message Signs and static sign messages. How can we leverage the general public’s understanding of web-based travel time map colors to incorporate color based numeric travel time messages on Dynamic Message Signs? Are there ways to improve colors for road user visibility, clarity, etc. Specifically with colors such as “amber”.

### 3. Anticipated Project Benefits and Expected Outcomes

#### A. Benefits

For each anticipated benefit, **describe in one or two sentences** how that benefit might be tracked or measured (quantitatively or qualitatively). Also, as best you can, indicate (with the number in the drop-down box) whether the source of the benefit measurement is from:

1. A specific research task in your project that supports measuring this particular benefit, or
  2. Implementation of the research findings (anticipating positive results)
- 
- i. Construction Saving: *Choose an item.*  
[Describe]
  - ii. Decrease Engineering/Administrative Cost: 2  
Improved decision-making processes for MnDOT, local agencies, and national agencies as well.
  - iii. Decrease Lifecycle Costs: *Choose an item.*  
[Describe]
  - iv. Environmental Aspect: *Choose an item.*  
[Describe]
  - v. Increase Lifecycle: *Choose an item.*  
[Describe]
  - vi. Operation and Maintenance Saving: *Choose an item.*  
[Describe]

- vii. Safety: 2  
Finding new ways to display messages that are easier for roadway users to understand will help reduce distractions and increase safety.
- viii. User Benefits: 2  
Improved DMS colors for road user visibility and clarity. Expanded use of DMS messaging for road user information such as travel time.
- ix. Risk Management: *Choose an item.*  
[Describe]
- x. Other (Specify): *Choose an item.*  
[Describe]

**B. Expected Outcomes: Check all expected outcomes of this research.**

- New or improved technical standard, plan, or specification
- New or improved manual, handbook, guidelines, or training
- New or improved policy, rules, or regulations
- New or improved business practices, procedure, or process
- New or improved tool or equipment
- New or improved decision support tool, simulation, or model/algorithm (software)
- Evaluation of a new commercial product
- Other (Specify):

## 4. Technical Advisory Panel

List the name and affiliation of individuals to consider for the Technical Advisory Panel:

- a. TBD
- b.
- c.
- d.
- e.

Your Project Advisor, assigned by the Office of Research & Innovation, will answer questions, and provide guidance: Marcus Bekele, [marcus.bekele@state.mn.us](mailto:marcus.bekele@state.mn.us)